NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION WATER CONVEYANCE
CORRUGATED, RIBBED OR PROFILE WALL THERMOPLASTIC PIPELINE
(feet)
CODE 794 (INTERIM)

DEFINITION

A pipeline and appurtenances installed in an irrigation system.

PURPOSE

This practice may be installed in a conservation management system to support one or more of the following:

* Prevent erosion.
* Prevent reduction in water quality.
* Reduce water conveyance losses.
* To make possible proper management of irrigation water.
* Prevent damage to land due to water logging.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to corrugated, ribbed or profile wall thermoplastic pipe with vents open to the atmosphere. Pipe shall be limited to maximum pipe diameters according to Table 1

All pipelines shall be planned and located to serve as integral parts of an irrigation water distribution or conveyance system designed to facilitate the conservation and management of soil and water resources on a farm or group of farms.

All areas served by the pipeline shall be suitable for use as irrigated land.

Water quality and quantity shall be sufficient to make irrigation practical for the crop to be grown and the irrigation water application methods to be used while considering the effects on downstream flows or aquifers. Consideration shall also be given to the effects of the planned pipeline on existing wetlands or water-related wildlife habitats.

Table 1. Maximum Diameter

Pipe	Max. Diameter inches
Corrugated Polyethylene (PE) Tubing and fittings, ASTM F-667 or	36
Corrugated PE Drainage Pipe, AASHTO M252	4 -10
Corrugated PE Pipe, 300-1200mm AASHTO M 294	12 - 48
Corrugated PE Pipe, 1350-1500 mm AASHTO MP7	60
Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe, ASTM F-894	120
Poly(Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter, ASTM F 794	48

CRITERIA

Friction losses. Friction head losses shall be no less than those computed by Manning Formula, with a coefficient of roughness 'n' according to Table 2.

Table 2. Manning's "n"

Pipe	Manning's "n"
PE Corrugated	0.020
PE Corrugated w/liner	0.012
PE Profile Wall	0.009
PVC Ribbed	0.009

Capacity. The design capacity of the pipeline shall be based on whichever of the following criteria is greater:

1. Capacity shall be sufficient to deliver the volume of water required to make irrigation practical for use on the crop or crops to be irrigated.

2. Capacity shall be sufficient to provide an adequate irrigation stream for the methods of irrigation to be used.

Pressure Head. All pipelines shall be designed for a maximum pressure head, measured from the pipe centerline according to Table 3.

Table 3. Maximum Pressure Head

Pipe	Max. Pressure Head - feet
PE Corrugated	12
PE Corrugated w/liner	12
PE Profile Wall	25
PVC Ribbed	25

Flow velocity. Design flow velocity at system capacity shall not exceed 5 ft/s on pipelines with valves or some other flow control appurtenance placed within the pipeline or at the downstream end.

External load limit. Maximum external load for each Pipe Stiffness (PS) class or Ring Stiffness Constant (RSC) shall be in accordance with the manufacturer's recommendation. External load shall include earthfill and live load, if applicable. Equivalent fill heights for live load are given in Table 4.

Table 4. Conversion of line load to total design fill loads

Point Live Load lb	Depth of Cover on Pipe ft	Equivalent Fill Height[1/] ft	Fill Height. (Dead + Live) ft
16,000	2.5	14 ft (9 ft)	16.5 (11.5)
(10,000)	3.0	10 ft (6 ft)	13.0 (9.0)
	4.0	5 ft (3 ft)	9.0 (7.0)
	5.0	3 ft (2 ft)	8.0 (7.0)
	6.0	2 ft (1 ft)	8.0 (7.0)
	8.0	1 ft (1 ft)	9.0 (9.0)
	10.0	0 ft (0 ft)	10.0 (10.0)

1/ assumed soil unit weight = 100 pcf.

Vents. Vents shall be designed into the systems to provide for the removal and entry of air and protection from surge. They shall:

1. Have a minimum freeboard of 1foot above the hydraulic grade line. The maximum height of the vent above the pipeline must not exceed the maximum allowable pressure head of the pipe.

2. Have a minimum diameter of 1/4 of the pipeline diameter.

3. Be located:

    a) At the upstream and downstream ends of the pipeline.

    b) At summits in the line.

    c) At points where there are changes in grade in a downward direction of flow of more than 10 degrees.

    d) At a maximum spacing of 1320-feet.

Drainage and flushing. Provisions shall be made for draining the pipeline to prevent freezing and/or flushing to prevent accumulation of sediment within the pipe, as necessary.

Drainage and/or flushing outlets shall be located at the low points along the line and shall be designed to minimize erosion or ponding. If drainage cannot be provided by gravity, provisions shall be made to empty the line by pumping.

Flushing outlets shall be large enough to create a velocity in the pipe which will transport the sediment accumulation.

Outlets. Appurtenances for delivering water from a pipe system to the land, to a ditch, or to a surface pipe system shall be known as outlets. Outlets shall have the capacity to deliver the required flow:

1. To a point at least 6-in. above the highest field elevation.

2. To the hydraulic grade line of a pipe, ditch, canal or water control structure.

Joints and connections. All connections shall be designed to withstand the maximum pressure

Materials. All materials shall meet or exceed the minimum requirements indicated in the Nevada Construction Specifications NV-45, Plastic Pipe Conduits.

CONSIDERATIONS

Water Quantity

1. Effects on the components of the water budget, especially infiltration and evaporation.
2. Effects on downstream flows or aquifers that would affect other water uses or users.
3. Potential use for irrigation water management.
4. Effects of installing a pipeline on vegetation that may have been located next to the original conveyance.

Water Quality

1. Effects of installing the pipeline (replacing other types of conveyances) on channel erosion or the movement of sediment and soluble and sediment-attached substances carried by water.
2. Effects on the movement of dissolved substances into the soil and on percolation below the root zone or to ground water recharge.
3. Effects of controlled water delivery on the temperatures of water resources that could cause undesirable effects on aquatic and wildlife communities.
4. Effects on wetlands or water-related wildlife habitats.
5. Effects on the visual quality of water resources.

Utilizing existing elevation differential, water delivery in closed pipelines can provide sufficient pressure to help operate sprinkler irrigation systems, thus eliminating or reducing pumping plant energy and associated operation and maintenance labor needs.

head of the pipeline without leakage or obstructions to the pipe flow area.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing plastic irrigation pipelines shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purposes.

OPERATION AND MAINTENANCE

An Operation and Maintenance plan must be prepared for use by the landowner or operator responsible for pipeline operation and maintenance. The plan should provide specific instructions for operating and maintaining the pipeline to insure it functions properly. Minimum requirements to be addressed in the Operation and Maintenance Plan are:

1. Prompt repair or replacement of damaged components is necessary. Check to make sure all valves and air vents are set at the proper operating condition so they may provide protection to the pipeline. Remove foreign materials and vegetation that can interfere with proper valve operation.

2. Maintain backfill over pipe and maintain vigorous vegetative growth where applicable.

3. Remove debris and litter and any blockage that restricts capacity.

4. Avoid travel and tillage over pipelines.

5. Control rodent to prevent damage to pipeline and appurtenances

List items specific to the project on the “Operation and Maintenance Worksheet”.

REFERENCES

USDA NRCS, National Engineering Field Handbook of Conservation Practices (NEH Part 650), Chapter 3, 15.